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(54) A method of and apparatus for sorting and bundling flowers.

(57) The invention relates to a method of sorting and bundling flowers (2), comprising hanging the flowers separately in individual flower supporting members (3) circulating in a first closed path (1); as they are traversing said path, coding the flowers as to at least one characteristic, such as stem length; depending on the coded characteristic, transferring the flowers to second flower supporting members (11) circulating in a second path (10); grouping the flowers into groups of a limited number of flowers; and collecting and bundling a series of groups into a bunch. According to the invention the individual flower supporting members are moved adjacent a transfer point from a transport position into a transfer position in a track substantially perpendicular to the first path, while during transfer the second flower supporting members are held stationary and oriented in the direction of movement of said individual flower supporting members. The invention further relates to apparatus for applying this method.

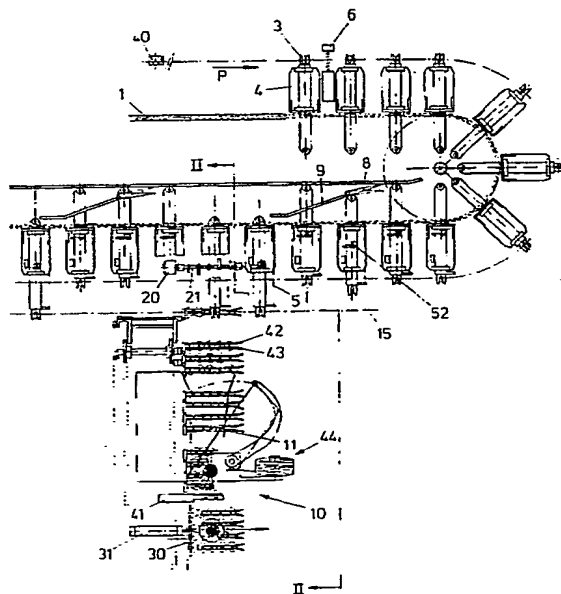


FIG.1

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This invention relates to a method of, and apparatus for sorting and bundling flowers comprising; and arranged for,

- hanging the flowers separately in individual flower supporting members circulating in a first closed path;
- as they are traversing said path, coding the flowers as to at least one characteristic, such as stem length;
- depending on the coded characteristic, transferring the flowers to second flower supporting members circulating in a second path;
- grouping the flowers into groups of a limited number of flowers; and
- collecting and bundling a series of groups into a bunch.

Sorting flowers as to a given characteristic, for example, stem length, and subsequently bundling flowers having the same characteristic is difficult to mechanize, especially as flowers are tender products which are apt to become damaged. One especially critical operation is the transfer of the flowers from a flower carrying support member to a flower receiving support member. The number of transfers per flower should be minimized and during each transfer the movements of flower carrying member and flower receiving member must be well-attuned to each other as regards both velocity and direction. A further important point is that during grouping the flower heads must not bear upon each other, as this may easily cause them to break off.

The problems outlined above are aggravated even further with increasing handling speeds.

Netherlands patent application 7310250 discloses a flower sorting apparatus in which flowers of a given stem length are transferred from a first conveyor to an intermediate conveyor associated with such stem length, and subsequently to a flower group supporting member which occupies an inclined position relative to the horizontal plane. In the first conveyor the flowers are supported by horizontal, L-shaped flower supporting members which in the transfer position make a pivoting movement whereby the flower traverses a circular path terminating in an individual flower receiving member of the intermediate conveyor, which during transfer is driven by the L-shaped flower supporting member. The slotted openings in flower supporting member and flower receiving member are in alignment with each other. It is difficult for these slotted openings to be well aligned, which is a condition for flower transfer free from damage. The L-shaped flower supporting members occupy a lot of space in the first conveyor, so that the number of flower supporting members per unit length is very limited. To achieve a reasonable operating speed at all, the first conveyor would have to be driven at a high

velocity. This, however, makes it considerably more difficult to place flowers in the flower supporting members of the conveyor.

From the intermediate conveyor the flowers slide into the inclined flower group supporting members, whereby the flower heads are pushed against each other.

It is an object of the present invention to provide a method and an apparatus in which the number of operations during sorting is limited, and each operation is better adapted to the tender product, while yet a high speed of operation is achieved. For this purpose the method according to this invention is characterized in that the individual flower supporting members are moved adjacent a transfer point from a transport condition into a transfer position in a track substantially perpendicular to the direction of movement of said first path, while during transfer said second flower supporting members are held stationary and oriented in the direction of movement of said individual flower supporting members.

By virtue of the flower supporting members being moved perpendicularly to the direction of movement of the first path to the transfer position, more flower supporting members can be provided in the first conveyor per unit length, as a result of which the capacity can be considerably increased. Also, the flower supporting members need not be moved to the transfer position exactly at the moment when they are in opposition to the flower receiving members, but this movement can already be performed before and hence more gradually. The orientation of the flower receiving member or second flower supporting member makes it possible for the second flower supporting member to be formed as a group supporting member adapted to receive successively a limited number of flowers. As a consequence, the intermediate conveyor can be done without, the routing of the flowers is simplified, and the number of transfers is limited to one.

The apparatus disclosed in Netherlands patent application 7310250 comprises

- a first conveyor including an array of first individual flower supporting members arranged to be brought from a transport position into a transfer position;
- a coding station for coding flowers carried by said first conveyor as to at least one characteristic, such as stem length;
- a series of second conveyors disposed next to the path of movement of said first conveyor, and having an array of second flower supporting members to which at least one flower can be transferred from a first flower supporting member placed in the transfer position;

- means for grouping a limited number of equally coded flowers in a slotted bifurcated flower supporting member.

According to the present invention, this apparatus is adapted for application of the method described above by virtue of the fact that the individual flower supporting members of said first conveyor are arranged to be shifted from the transport position into the transfer position in a straight line substantially perpendicular to the direction of movement of said first conveyor, while during transfer the second flower supporting members are in a stationary position with a flower receiving slot oriented according to the direction of movement of the first flower supporting members.

In this apparatus, each flower supporting member of the first conveyor is preferably mounted for axial sliding movement in a carrier including a spring-loaded catch mechanism for holding the flower supporting member in the extended transfer position, said catch mechanism being arranged to be unlocked by means of a cam arranged in its path of movement.

In this way, a flower can be positioned in a flower receiving member or second flower supporting member at an exactly determined place. This is of particular importance if the second flower supporting members are arranged to receive more than one flower. By virtue of that arrangement, the flower heads are not pushed against each other.

It is noted that United States patent specification 3,659,709 discloses a flower sorting apparatus comprising a first conveyor including flower carrying members and associated stem length detectors, a series of intermediate conveyors arranged perpendicularly to the direction of movement of the first conveyor for receiving flowers of a given stem length, a transfer conveyor for transferring flowers from the intermediate conveyors to a terminal conveyor, which is equipped with flower supporting members for receiving a group of flowers. The flower receiving members of both the intermediate conveyors and the terminal conveyor are provided with slots oriented in the direction of movement of the first conveyor and the transfer conveyor, respectively. The flower carrying members of the first conveyor are provided with pivoting camming discs which in the transfer position describe a circular path under the direction of a controllable cam follower. The flower carrying members proper are mounted on the camming discs by means of a parallel guide. The number of camming discs per unit length of the conveyors is small. The transfer conveyor is equipped with similar camming discs, which during the transfer operation have to follow a complicated track. The number of operations to which the flowers are subjected in that apparatus is considerably larger than in the apparatus according

to the present invention, while the apparatus itself is highly complicated.

The method according to the present invention and an embodiment of the apparatus for the application thereof will now be described, by way of example, with reference to accompanying drawings. In said drawings,

Fig. 1 illustrates a schematic top plan view of the apparatus according to the present invention;

Fig. 2 illustrates a cross-sectional view taken on the line II-II of Fig. 1;

Fig. 3 shows a diagrammatic side-elevational view of the stem length measuring device;

Fig. 4 is a diagrammatic elevational view, showing the means for delivering flowers in fixed, adjustable positions; and

Fig. 5 shows the means for changing the height of the flower supporting members to provide for a substantially flat top after the removal of a bundled bunch of flowers.

The apparatus for sorting and bundling flowers comprises a first conveyor 1, into which flowers 2 are hung by hand. For this purpose conveyor 1 includes fork-shaped or bifurcated individual flower supporting members 3 mounted for axial sliding movement in a carrier 4, which carriers are fixedly connected to conveyor 1. The flower supporting members 3 are maintained in the transport position in carriers 4 by means of a tension spring 5. The direction of movement of conveyor 1 is indicated by an arrow P in Fig. 1.

Arranged alongside the path traversed by the flower supporting members 3 is a wetting member 40 in the form of a sprayer, sponge or the like, to wet said members and thereby prevent damage to the flowers 2 during their introduction.

During their passage of the closed path through conveyor 1 in the direction indicated by arrow P, the flowers 2 pass a measuring station 6 which includes a series of photocells 7 arranged at different levels with light sources 7' placed in opposition thereto. Photocells 7 are connected to a computer (not shown) with a store in which the measured stem length of a flower 2 is stored, coupled to the serial number of carrier 4. As further shown by Fig. 1, the apparatus includes a series of second conveyors 10, each provided with a plurality of groupwise arranged bifurcated flower supporting members 11 capable of supporting a limited number of flowers 2 groupwise. Conveyors 10, only one of which is shown, are arranged in closely-spaced interrelationship alongside the path traversed by conveyor 1.

The individual flower supporting members 3 can be moved outwards into the transfer position relative to the associated carrier 4 by means of a switch 8 and a guide 9. In that case switch 8 is

operated by the above computer, in which it is determined to which conveyor 10 a flower 2 is to be delivered. When the switch 8 is placed in the position shown in solid lines in Fig. 1, fork 3 with the flower 2 will be moved outwards until the flower 2 is in the dotted line designated by 15 in Fig. 1. The flower supporting member 3 is held in the extended transfer position by a catch mechanism 52 provided in carrier 4, which prevents spring 5 from retracting the flower supporting member 3 back into the transport position. Line 15 coincides with the axis of the slot of the flower supporting member then presenting itself, so that during the continued movement of conveyor 1 flower 2 will automatically move into the slot of fork 11. Flower 2 can be delivered to the slot of fork 11 at different places by means of a mechanism which comprises a camshaft 21 controlled by a rotary magnet 20. Camshaft 21 (Fig. 4) is provided with as many cams as there are flower receiving places in the slot of a fork 11. Carrier 4 with the flower supporting member 3 in the advanced transfer position will continue to move along line 15 until the catch mechanism 52 provided in carrier 4 strikes a cam of camshaft 21. The catch mechanism 52 will then be lifted out of its locked position against the action of a tension spring, and subsequently the flower supporting member 3 is rapidly withdrawn. When the slot of fork 11 is empty, the rear cam 52 of camshaft 21 will be placed in the path of the catch mechanism, and the flower 2 will be delivered in the rearmost position of the slot. Subsequently, the adjacent cam will be moved into the arresting position, so that the next flower 2 will be placed next to the earlier transferred flower in the slot of fork 11. This system is known per se from U.S. patent specification 3,220,154. As soon as the slot of a fork 11 is fully filled with flowers - five in the present case - the chain of the second conveyor 10 from which fork 11 is suspended is moved by a small increment to move a next fork 11 in the path of line 15. When the four forks 11 of a group are filled with flowers, conveyor 10 can be moved a larger distance to create a space between the successive groups of forks 11, needed to bundle the flowers present in a group of forks 11. The bundling device 44 is shown schematically only, as it is known in practice and commercially available in the Netherlands, for example, from the firm of "Cycklop International".

The direction of movement of conveyors 10 is perpendicular to that of conveyor 1, with conveyors 10 circulating in a vertical plane and conveyor 1 in a horizontal plane located approximately at the level of the median plane F of conveyor 10 (see Fig. 2). In the transfer position between conveyors 1 and 10, one flower supporting member 11 of conveyor 10, secured to a mounting yoke 13, is in

the median plane F of said conveyor, which creates sufficient space for such transfer. This transfer is facilitated by giving the ends 42, 43 of the bifurcated flower supporting members 11 a V-shaped configuration, with one tine 42 being optionally shorter than the other tine 43.

When the flowers have been bundled, they are cut to a uniform size by means of a sawing device or cutter 41, shown diagrammatically. Before the cutting operation, some forks 11 are raised a little relatively to the adjacent forks 11 of a group by means of a guide track 14, along which rollers 15 run, which are connected to forks 11 (see Fig. 5). It is thus achieved that the flowers of each bunch are in virtually co-planar relationship after bundling.

After the bundling and cutting operations, the flowers are moved out of the conveyor bunch by bunch by means of a shift plate 30 operated by a pneumatic cylinder 31. As they are shifted out, the bunch of flowers is raised somewhat by means of a lift table 32 operable by a pneumatic cylinder 33, to prevent the flowers from sliding or chafing over the upper surfaces of the bifurcated flower supporting members 11.

## Claims

1. A method of sorting and bundling flowers, comprising
  - hanging the flowers separately in individual flower supporting members circulating in a first closed path;
  - as they are traversing said path, coding the flowers as to at least one characteristic, such as stem length;
  - depending on the coded characteristic, transferring the flowers to second flower supporting members circulating in a second path;
  - grouping the flowers into groups of a limited number of flowers; and
  - collecting and bundling a series of groups into a bunch,
 characterized in that the individual flower supporting members are moved adjacent a transfer point from a transport position into a transfer position in a track substantially perpendicular to said first path, while during transfer said second flower supporting members are held stationary and oriented in the direction of movement of said individual flower supporting members.
2. Apparatus for applying the method as claimed in claim 1, comprising
  - a first conveyor including an array of first individual flower supporting members arranged to be brought from a transport

- position into a transfer position;
- a coding station for coding flowers carried by said first conveyor as to at least one characteristic, such as stem length;
  - a series of second conveyors disposed next to the path of movement of said first conveyor, and having an array of second flower supporting members to which at least one flower can be transferred from a first flower supporting member placed in the transfer position;
  - means for grouping a limited number of equally coded flowers in a slotted bifurcated flower supporting member,
- characterized in that the individual flower supporting members (3) of said first conveyor (1) are arranged to be shifted from the transport position into the transfer position in a straight line substantially perpendicular to said first conveyor (1), while during transfer the second flower supporting members (11) are in a stationary position with a flower receiving slot oriented according to the direction of movement (15) of the first flower supporting members (3).
3. Apparatus as claimed in claim 2, characterized in that each flower supporting member (3) of the first conveyor (1) is mounted for axial sliding movement in a carrier (4) including a spring-loaded catch mechanism (52) for holding the flower supporting member (3) in the extended transfer position, said catch mechanism being arranged to be unlocked by means of a cam (21) arranged in its path of movement.
  4. Apparatus as claimed in claims 2-3, characterized in that the second flower supporting members (11) have a flower receiving slot adapted to receive a group of a limited number of flowers.
  5. Apparatus as claimed in claim 4, characterized by a camshaft (21) arranged adjacent the transfer position, said camshaft (21) having as many cams as the number of flowers that can be received in a second flower supporting member, which cams can alternately be moved into the path of movement of a catch mechanism (52).
  6. Apparatus according to any of claims 2-5, characterized in that the second flower supporting members (11) are connected to the second conveyor (10) by means of mounting yokes (13), said second conveyor (10) circulating in a vertical plane, and its median plane (F) being approximately at the level of the horizontal plane of movement of the first conveyor (1), the arrangement being such that in the transfer position, each second flower supporting member (11) extends horizontally and is located in the plane of movement of said first conveyor (1), in spaced relationship to the adjacent mounting yokes (13).
  7. Apparatus as claimed in claim 6, characterized in that the second flower supporting members (11) are pivoted to the associated mounting yokes (13) and by means of a guide track (14) and spring-mounted traveling rollers (15) cooperating with said guide track (14) are caused to occupy a horizontal position during the transfer of flowers and the bundling thereof.
  8. Apparatus as claimed in claim 7, characterized in that said guide track (14) includes vertically elevated portions in order that the front and rear flower supporting members (11) of a group may be varied in height relative to each other.
  9. Apparatus as claimed in any one of claims 2-8, characterized in that interspaces are provided between groups of flower supporting members (11) in the second conveyor (10) to enhance the accessibility of a group for bundling the flowers into bunches.
  10. Apparatus as claimed in any one of claims 2-9, characterized by means (32, 33) for lifting a cut bunch a small distance just before they are moved out of the flower supporting members (11) to prevent injury to the flowers as they are so moved out.
  11. Apparatus as claimed in any one of claims 2-10, characterized by means (40) for making the first flower supporting members (3) wet or greasy.
  12. Apparatus as claimed in claim 11, characterized in that said means (40) are one or more sprayers, brushes, sponges, or the like.
  13. Apparatus as claimed in any one of the preceding claims 2-12, characterized in that the tines of the forks of the first conveyor are arranged in V-shaped formation with the leading tine of each fork being shorter than the trailing tine.

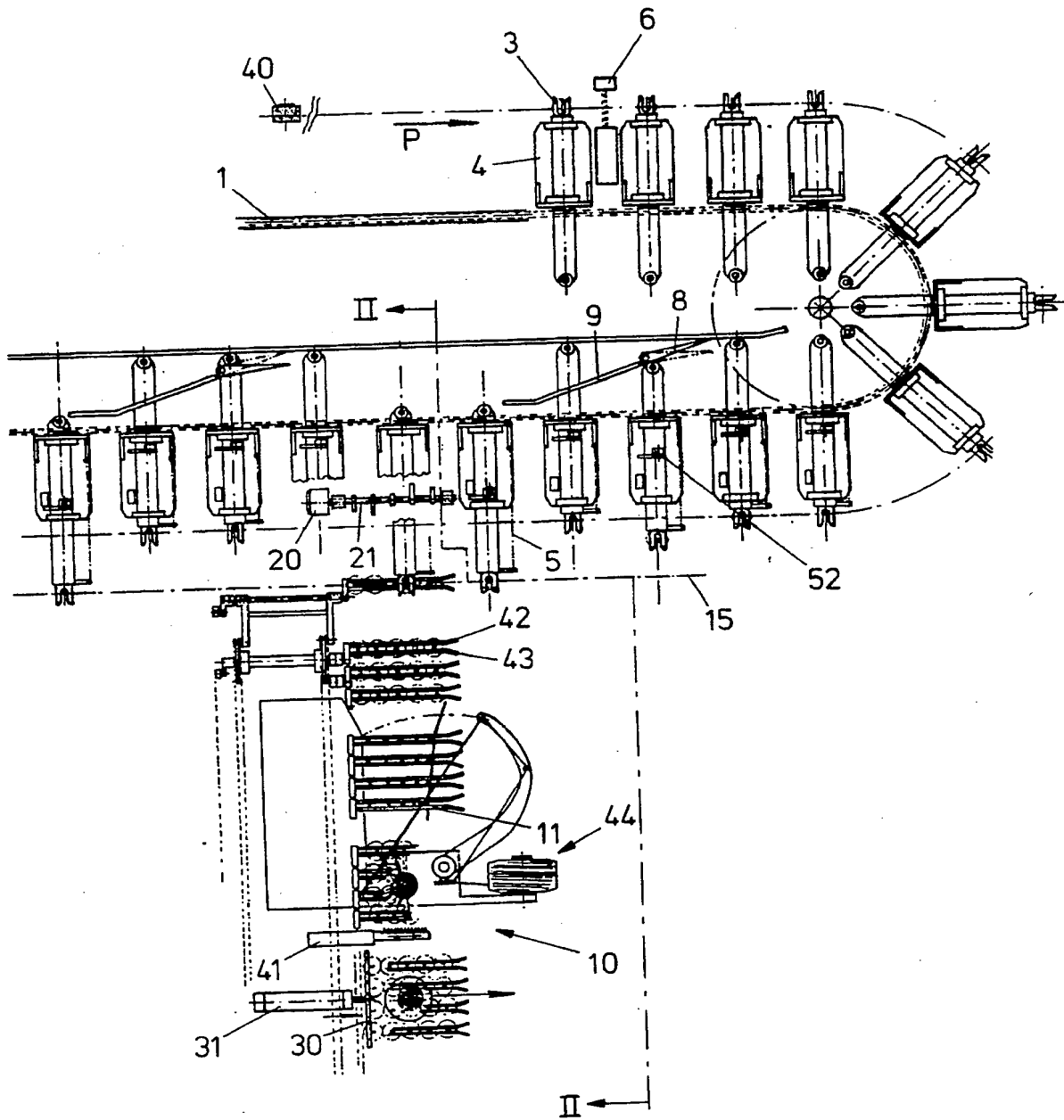


FIG.1

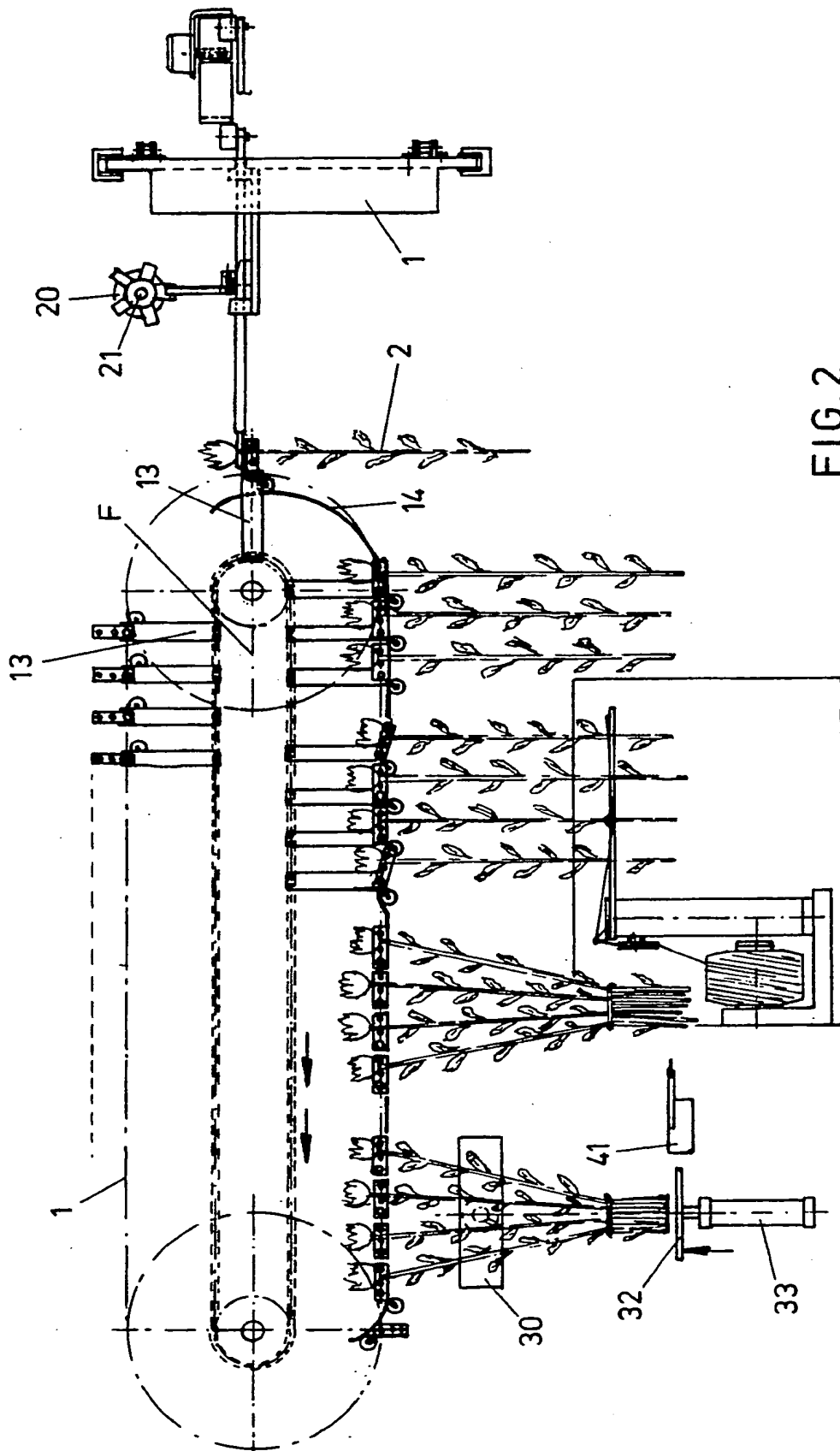


FIG. 2

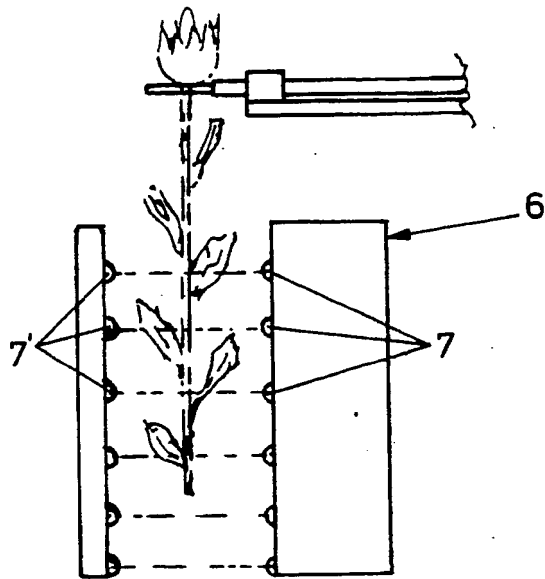


FIG. 3

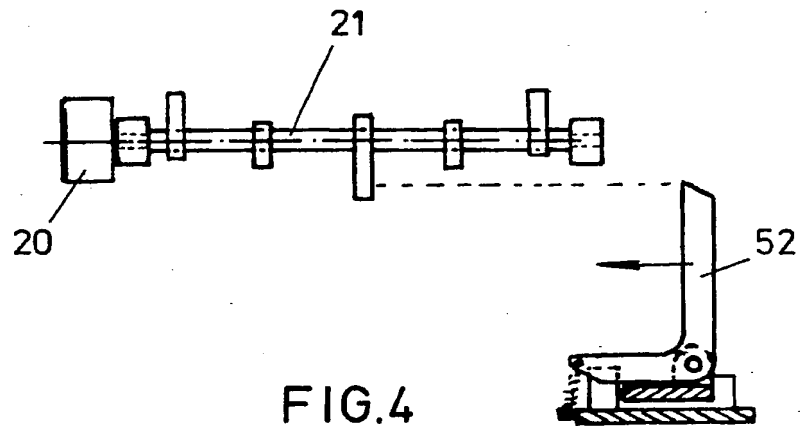


FIG. 4

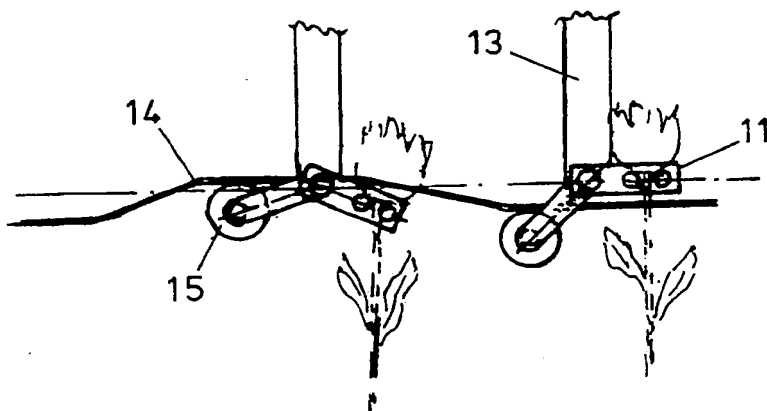


FIG. 5





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## EUROPEAN SEARCH REPORT

Application Number

EP 91 20 0723

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A,D	US-A-3 659 709 (BARTLETT) * column 2, line 1 - column 7, line 17; figures 1,3,6,7 * -----	1,2,13	A 01 G 5/00
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A 01 G B 07 C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 28 June 91	Examiner HERYGERS J.J.
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